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PERFORMANCE OF ELITE FINGER MILLET CULTURES FOR GRAIN YIELD, YIELD INFLUENCING TRAITS AND BLAST TOLERANCE

L. MADHAVILATHA[1] & M. SUBBA RAO[2]

[1]Scientist, Department of Plant Breeding, Agricultural Research Station, Perumallapalle, Tirupati, Andhra Pradesh, India

[2]Principal Scientist (Millets), Agricultural Research Station, Perumallapalle, Tirupati, Andhra Pradesh, India

ABSTRACT

Thirteen promising Finger millet genotypes developed from various Agricultural research stations of Andhra Pradesh along with two checks were evaluated for grain yield and yield contributing traits during Kharif 2013. These entries were also screened for Blast disease tolerance including blast susceptible check (Champavathi). Among the tested entries PPR 1012 (48.43 q/ha) recorded significantly higher grain yields when compared to the checks. VR 989, PPR 1044 and PPR 1041 genotypes also recorded numerically higher grain yields than checks Vakula and Saptagiri but they were on par to the high yielding check Vakula. The high yielding Finger millet culture PPR 1012 with low blast disease incidence score (Leaf blast: 1, Neck blast: 9.46 %, Finger blast: 10.91 %) has been promoted to minikit testing during 2014 in Andhra Pradesh state to study its performance in the farmer's fields.

KEYWORDS: Finger Millet, Yield Traits, Variability, Blast Screening

INTRODUCTION

Finger millet (*Eleusine coracana* L.) is an important food crop of India grown in diverse agro – ecological conditions. It is the staple food for rural and working people occupying 2.4 million hectares with a production of 2.6 million tonnes. Finger millet crop is commonly known as Ragi, an important food crop and largely grown in Southern states of India (Shanthakumar, 2000). It is highly priced and valued for its biotic and abiotic stresses tolerance and nutritional value (Barbeau and Hilu, 1993). Finger millet straw makes good fodder and contains up to 61 % total digestible nutrients (National Research Council, 1996). The great merit of finger millet is that it can be stored up to ten years or more without deterioration and insect damage. Consequently it has traditionally played an important role as reserve crop (Purseglove, 1972). In spite of all these advantages of Finger millet crop, the state average grain yield productivity levels of the crop are low (1000 kg/ha), although it has a potential to yield up to 3000 kg/ha. To achieve the higher grain yield productivity levels, identification and development of the improved cultures with wide adaptability over environments is very necessary. Blast is one of the devastating diseases in Finger millet crop which is caused by the fungus *Pyricularia grisea*. Blast affects Finger millet crop in all stages causing leaf blast, neck blast and finger blast causing grain yield losses up to 80-90 % in endemic areas (Rao, 1990). Hence the present study was undertaken to evaluate and identify the high yielding and blast tolerant lines among the promising Finger millet cultures developed from various Agricultural research stations of Andhra Pradesh state.

MATERIALS AND METHODS

The experiment was conducted at Agricultural Research Station, Perumallapalle during *Kharif 2013*. Thirteen promising Finger millet entries developed from various agricultural research stations, PPR 1012, PPR 1040, PPR 1041, PPR 1044, VR 989, VR 990, VR 1042, VR 1044, PR – 10 - 14, PR – 10 - 21, PR – 10 - 26, PR – 10 - 30 and PR – 10 - 45 along with two local checks (Vakula and Saptagiri) were evaluated for grain yield and yield contributing traits. These entries were also screened for all the three types of Blast disease (Leaf blast, Neck blast and Finger blast) including blast susceptible check (Champavathi). The trial was laid out in Randomized complete Block design with three replications. Nursery was raised on small plots and the seedlings were transplanted into main field plots. Each experimental plot had ten rows of three meter length with a spacing of 30 cm between rows and 10 cm between plants with a gross area of 6.75 sq. m. Fertilizers were applied at the rate of 60: 40: 30 kg NPK/ha. All the recommended package of practices were followed. Five plants from each entry and replication were randomly selected for data recording except for days to maturity and grain yield which are on plot basis. Plot grain yield (kg/plot) data was converted in to hectare grain yield (q/ha). The observations on days to maturity, plant height (cm), productive tillers per plant, ear length (cm), number of fingers per ear head and grain yield (kg/plot) were recorded. The leaf blast disease observations were recorded at tillering stage by using 0-5 rating scale. 0 = No infection (Immune), 1= 0.1 % to 1 % infection (Resistant), 2= 1 to less than 5 % infection (Moderately Resistant), 3 = 5 to less than 25 % infection (Moderately Susceptible) 4 = 25 % to less than 50 % infection (Susceptible) and 5= equal or more than 50 % infection (Highly Susceptible). The neck blast and finger blast observations were recorded at the dough stage of the crop. Neck blast incidence was recorded by counting the number of peduncles infected in total number of peduncles in the plot and finger blast incidence as the percentage of fingers affected in a known crop area / plants (Nagaraja *et al.,* 2007). The mean values of the recorded data were subjected to analysis of variance (ANOVA) using the statistical analysis procedures of Sharma, 1998 to know the significant differences among the genotypes tested.

RESULTS AND DISCUSSIONS

Fifteen entries were evaluated for grain yield and yield contributing traits. The mean performance of the entries for the recorded traits was presented in table 1. Analysis of variance revealed significant differences among the genotypes for all the characters under study, indicating considerable amount of variability in experimental material. Similar significant differences for yield and yield contributing traits were reported by Suryanarayana *et al.,* 2014 and Reddy *et al.,* 2013. Abraham et al. (1989) found significant variation for grain yield and number of productive tillers per plant. Joshi and Mehra (1989) reported significant variation for days to heading, plant height, finger length, number of fingers, and grain yield but observed non-significant differences for number of effective tillers.

The maturity duration for the entries ranged from 101 days (Vakula) to 129 days (PR – 10 - 45. Among the fifteen entries the check Vakula (101 days) matured early when compared to the other tested entries, which is a medium duration variety. The tested entries recorded the plant height in the range of 87 cm (PPR 1040) to 136 cm (VR 990). Maximum plant height was recorded in VR 990 (136 cm) followed by PPR 1012 (126 cm). Number of productive tillers per plant for the entries was ranged from 1.3 (PPR 1040) to 2.1 (VR 990). The number of productive tillers in a plant is an important trait which directly influences the grain yield. Ear head length for the tested entries was ranged from 7.9 cm (VR 989 and VR 990) to 11 cm (PPR 1012). More number of fingers per ear head was observed in high yielding check Vakula (14.7). In the high yielding entry PPR 1012 the number of fingers per ear head were low (7.3) but it was recorded more number of

productive tillers (1.8) and lengthy fingers (11.0 cm) which could have influenced to achieve higher grain yield. For grain yield PPR 1012 recorded significantly highest grain yield (48.43 q/ha) when compared to the high yielding check Vakula (40.24 q/ha) with a duration of 120 days. VR 989 (44.55 q/ha), PPR 1044 (43.86 q/ha) and PPR 1041 (40.52 q/ha) genotypes also recorded higher grain yields than high yielding check Vakula (40.24 q/ha) which were on par to the check. PPR 1012, VR 989, PPR 1044 and PPR 1041 were the desirable genotypes which can be promoted to develop high yielding varieties and they could be utilized in breeding programmes.

The results of blast disease screening revealed that among the sixteen entries, most of the entries showed moderately resistant reaction to leaf blast, neck blast and finger blast except susceptible check Champavathi which showed susceptible reaction to the blast disease. Among the tested entries two entries PPR 1012 (Leaf blast: 1, Neck blast: 9.46 %, Finger blast: 10.91 %) and VR 1044 (Leaf blast: 2, Neck blast: 9.83 % Finger blast: 14.32 %) were resistant to all the three types of blast disease which can be utilized as resistant sources in crop improvement programme. Several earlier workers have reported a wide range of reaction from resistant to highly susceptible reactions in finger millet cultures (Kumar and Kumar, 2009).

The high yielding Finger millet culture PPR 1012 (48.43 q/ha) with low blast disease incidence score has been promoted to minikit testing during 2014 in Andhra Pradesh state to study its performance of the entry in farmers fields.

CONCLUSIONS

In the crop improvement programme, yield evaluation trials are very important to know the stable performance of the varieties. Hence the present study was conducted among the Finger millet advanced cultures developed from various research stations of Andhra Pradesh. The results revealed that the entry PPR 1012 (48.43 q/ha) recorded significantly higher grain yields and showed tolerance to all the three types of blast when compared to the other tested entries. Now this entry is in minikit testing to know the yields stability in farmers fields and farmers acceptance. VR 989, PPR 1044 and PPR 1041 genotypes also recorded numerically higher grain yields than checks were also advanced for further testing. All these four entries were also promoted for testing in co-ordinated trials.

Table 1: Mean Performance of Finger Millet Entries for Yield, Yield Attributing Traits and Blast Disease Tolerance at ARS, Perumallapalle During Kharif, 2013

S. No	Entry	Name of the Developing Centre	Days to maturity	Plant height (cm)	Productive tillers / plant	Ear length (cm)	No of fingers / ear	Grain yield (q/ha)	Leaf Blast	Neck blast (%)	Finger blast (%)
1.	PPR 1012	ARS, Perumallapalle	120	126	1.8	11.0	7.3	48.43	1	9.46	10.91
2.	PPR 1040	ARS, Perumallapalle	107	87	1.3	8.4	13.8	37.93	2	13.42	25.31
3.	PPR 1041	ARS, Perumallapalle	109	93	1.4	8.7	12.7	40.52	2	23.64	33.99
4.	PPR 1044	ARS, Perumallapalle	108	98	1.9	9.3	13.6	43.86	2	21.08	32.70
5.	VR 989	ARS, Vizianagaram	116	121	1.9	7.9	7.5	44.55	3	24.50	39.08
6.	VR 990	ARS, Vizianagaram	118	136	2.1	7.9	7.7	30.86	2	11.95	22.27
7.	VR 1042	ARS, Vizianagaram	123	97	1.4	9.5	7.9	35.82	1	13.12	22.22
8.	VR 1044	ARS, Vizianagaram	116	91	1.9	10.4	7.3	34.71	2	9.83	14.32
9.	PR 10 – 14	ARS, Peddapuram	121	91	1.5	9.7	8.1	23.84	2	12.76	18.83
10.	PR 10 - 21	ARS, Vizianagaram	122	101	1.5	10.6	6.6	34.10	1	12.63	25.58
11.	PR 10 - 26	ARS, Vizianagaram	125	89	1.4	10.1	7.8	15.06	2	15.18	22.14
12.	PR 10 – 30	ARS, Vizianagaram	127	98	1.5	9.5	9.3	12.88	2	10.41	17.02
13.	PR 10 – 45	ARS, Vizianagaram	129	97	1.6	8.1	9.6	22.80	1	11.94	19.12
14.	Saptagiri (Check)	ARS, Perumallapalle	116	114	1.9	8.9	8.7	38.67	1	10.75	24.98
15.	Vakula (Check)	ARS, Perumallapalle	101	94	1.6	9.9	14.7	40.24	1	10.66	26.47
Champavathi (Blast Susceptible Check)									3	36.54	42.48
GM		-	**117**	**102**	**1.6**	**9.3**	**9.5**	**33.62**	-	-	-
SEm		-	**0.080**	**2.799**	**0.080**	**0.428**	**0.359**	**1.587**	-	**0.767**	**0.60**
C.D (0.05)		-	**0.233**	**4.743**	**0.233**	**1.224**	**1.045**	**4.622**	-	**2.334**	**1.83**
CV (%)		-	**8.181**	**8.151**	**8.181**	**7.793**	**6.543**	**8.090**	-	**7.033**	**3.35**

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